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Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 91

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AUSTRALIA MAY HELP EGYPT PROSPECT FOR URANIUM

Rangoon THE WORKING PEOPLE'S DAILY in English 21 Mar 81 p 5

[Text]

CAIRO, 19 March—Australian Deputy Prime Minister Doug Anthony disclosed here today that Australia might help Egypt in prospecting for uranium and was ready to provide nuclear fuel for atomic power plants.

Mr Anthony, who held talks here with Egyptian officials, told a Press conference that Egypt last month had signed the Nuclear Non-Proliferation Treaty renouncing the production of nuclear arms and providing for international inspection.

Mr Anthony said he was convinced an agreement with Egypt would be signed that would permit an Egyptian nuclear power plant to be operational by 1989.

Mr Anthony said also that Australia would not participate in any multinational force in the Sinai following a planned Israeli pullout in 1982 unless such a force was placed under the United Nations.

"We provide peacekeeping forces when they are under the umbrella of the United Nations, and we hope there will be peacekeeping forces in Sinai," he said, but 'otherwise we reserve our position".—*NAB/AFP*

CSO: 5100

FRANCE SIGNS COOPERATION AGREEMENT WITH SOUTH KOREA

SK040054 Seoul YONHAP in English 0046 GMT 4 Apr 81

[Text] Seoul, 4 Apr (YONHAP)--Korea's Foreign Minister No Sin-yong and his visiting French counterpart Jean Francois-Poncet Saturday signed agreements on the peaceful use of nuclear power, economic cooperation and scientific and tecynological cooperation, the Foreign Ministry here announced.

The agreement on the peaceful use of nuclear power calls for strengthening bilateral cooperation in studying and developing nuclear power, and promoting exchanges of information and scientists between the two countries. The agreement also includes a provision which bans producing nuclear weapons or using nuclear power for military purposes. The agreement also provides a basis for French participation in constructing Korea's nuclear power plants Nos 9 and 10.

The economic agreement covers bilateral cooperation in fields such as investment, capital, technology, information exchanges, agriculture, communications and the chemical industry. The agreement also calls for the establishment of a Korean-French joint committee on economic cooperation. The agreement on scientific and technological cooperation also contains provisions for bilateral exchanges of scientists and technologists and for holding joint research seminars.

François-Poncet is scheduled to leave Seoul Saturday afternoon.

CSO: 5100

BRIEFS

FRANCE, EGYPT SIGN AGREEMENT--Paris, 27 Mar (XINHUA)--France will build two nuclear power stations for Egypt, according to an agreement on cooperation in the peaceful use of nuclear energy signed by the two countries here today. Under the agreement, signed by French Minister of Industry Andre Giraud and Egyptian Minister of Electricity Mahir Abaza, Egypt will pay 10 billion francs in cash for the construction of the two stations, each with a generating capacity of 1,000 megawatts. It hopes that the stations would be put into operation in 1985 and 1986 respectively. The two countries also signed a protocol on the training of Egyptian technicians to run the stations. [Text] [OW280832 Beijing XINHUA in English 0826 GMT 28 Mar 81]

USSR-LIBYA NUCLEAR PACT--Paris, 28 Mar (AFP)--Libya's Colonel Mu'ammar al-Qadhdhafi is to sign an agreement with the Soviet Union on the installation of a nuclear research center in his country, the Arab-language AL-MUSTAQBAL weekly claimed today. Quoting informed Arab sources, the newspaper said that Col Al-Qadhdhafi would finalize the agreement during a forthcoming trip to the Soviet Union whose exact date has not yet been set. According to Soviet sources, the weekly added, the principle of Soviet aid in the creation of such a center had been approved by the Soviet Communist Party's Central Committee. AL-MUSTAQBAL added that Colonel Al-Qadhdhafi received an invitation to visit Moscow on March 18. [Text] NC282140 Paris AFP in English 2130 GMT 28 Mar 81]

EUROTOM NUCLEAR AGREEMENT--Australia and the European Atomic Energy Commission have signed a draft nuclear safeguards agreement which will pave the way for Australian uranium exports to 10 European countries. The signing took place in Canberra following a week of talks between Australian officials and a six-man delegation from Euratom. The agreement will have to be approved by the 11 governments involved. Details of the agreement will not be released until they are tabled in Federal Parliament. However, Radio Australia's Canberra office understands that it followed the same broad lines as the safeguards agreement Australia signed with France last year. Under that agreement France has pledged not to reprocess Australian uranium for military purposes. [Text] [OW301427 Melbourne Overseas Service in English 1230 GMT 30 Mar 81]

CSO: 5100

BRIEFS

AUSTRALIAN COMMITMENT TO JAPAN--Australia's commitment to supply uranium for Japan's nuclear energy program has been reaffirmed. Speaking in Sydney today at the ninth annual Australian-Japan relations seminar, the foreign affairs minister, Mr Street, said Australia was willing and able to supply uranium on a regular basis. Shipment was scheduled to begin next year pending the ratification by both governments of the nuclear safeguards agreement. [Text] [OW271409 Melbourne Overseas Service in English 1230 GMT 27 Mar 81]

CSO: 5100

TECHNOLOGY FOR MAKING MIXED OXIDE FUEL DEVELOPED

Rangoon THE WORKING PEOPLE'S DAILY in English 22 Mar 81 p 6

[Text]

New Delhi, 20 March —The Bhabha Atomic Research Centre near Bombay has developed a technology for making mixed oxide fuel for use in certain types of reactors, Minister of State for Science and Technology CPN Singh told Parliament Thursday.

The question of India's utilising spent uranium as fuel for the Tarapur atomic power station in case the United States does not fulfil its commitment will be considered when the need arises, he said.

Under the 1963 agreement with India, the United States was required to complete a "joint determination" exercise on the "safeguardability" of the reprocessing plant before the spent fuel could be reprocessed.

The US had not responded to India's repeated approaches for the completion of the formality.

NAB/PTI

CSO: 5100

SCIENTIST TELLS PLANS FOR CALCUTTA CYCLOTRON

Calcutta THE STATESMAN in English 19 Mar 81 p 8

[Text] THE variable energy cyclotron installed at Salt Lake, Calcutta, by the Bhabha Atomic Research Centre (BARC) started functioning in January. To mark this major achievement, Dr Raja Ramanna, Director of BARC, visited the Salt Lake establishment last month and told the Press about its success. Some routine experiments with the cyclotron are already being conducted; eventually the machine is expected to help Indian scientists not only to carry out fundamental studies about the structure of matter, but also to contribute directly to the Indian nuclear energy programme.

Principles Of A Cyclotron

The principles of a cyclotron, popularly known as an atom-smashing machine but more correctly called a particle accelerator, are extremely complex. Its basic purpose is to accelerate nuclear particles to such high energies that they can be used as projectiles to bring about changes in the structure of target material or rather in the atoms or sub-atomic particles which they hit. The acceleration is caused by the action of strong magnetic and electric fields on electrically charged particles. Usually, these particles are nuclei of atoms, such as protons (nuclei of hydrogen atoms), deuterons (nuclei of heavy hydrogen atoms) and alpha particles (nuclei of helium atoms).

When an atom is stripped of one of its orbital electrons, it becomes a singly charged positive ion. When two or three of its electrons are stripped of, it becomes doubly or triply charged ion. Besides protons, alpha particles and other light ions, heavier ions such as those of carbon, oxygen nitrogen, etc. can be accelerated by a cyclotron. The accelerated particles released from the machine are made to collide with a target and the collision may give rise to several events.

The particles may just pass through the target without disturbing its structure. They may be absorbed by the nuclei of the target elements and transmute them to form other varieties or isotopes of those elements. Sometimes the colliding particles disappear, and other fundamental particles are simultaneously produced. The collisions may even annihilate the particles, resulting in the creation of radiation energy. All these reactions help scientists to know more about basic properties of matter.

The Calcutta cyclotron is capable of accelerating protons to an energy range of 6 to 60 million electron volts, (MeV) deutrons from 12 to 65 MeV and alpha particles from 25 to 120 MeV. (An electron volt is a unit of energy equal to that gained by an electron in passing through potential rise of one volt). One practical application of these energised particles is in the production of specific isotopes which cannot be produced in a nuclear reactor. Such isotopes include gallium-67 and iodine-123, which have important medical uses.

However, Dr Ramanna told this correspondent in a recent interview: "Our primary objectives will be to undertake investigations in radiation damage". This, he explained, will be essential for advanced nuclear power technology, especially in the development of breeder reactors, in which fast neutrons play a great role.

"Fast neutrons can damage the materials of the conventional type of reactors, including fuel claddings and the reactor vessel itself. By extracting high energy particles from the cyclotron and colliding them with various materials we can know in advance what kind of materials would be suitable for breeder reactors. This can save a lot of money and time. If we make a breeder reactor without obtaining prior information about radiation damage, we may face problems".

Dr Ramanna said that research workers from the universities should also use the facilities of the variable energy cyclotron. "For that, they will have to make their own research structures to utilise the cyclotron facilities".

New Infrastructure

When BARC undertook the cyclotron project, there gradually developed an infrastructure which had earlier been lacking. The cyclotron required a very large electromagnet, with 280 tons of a specific type of iron core. No foundry in the country was equipped to handle such a massive structure. BARC helped an industrial establishment to make the magnet with indigenous materials. Water-cooled magnet-coil, developed for the first time for the cyclotron, has been another technological contribution. Vacuum chambers of a large size were also developed for the cyclotron; the technology is being used by the industries to manufacture vacuum chambers for ground testing of satellites and their components by the Indian Space Research Organization.

In fact, many types of sophisticated and extraordinarily high-precision equipment have been developed for the first time for the cyclotron. The skill and experience thus acquired will help Indian scientists and technologists to go ahead with the construction of bigger accelerators.

CSO: 5100

BRIEFS

VANADIUM DISCOVERY--New Delhi, March 15 (PTI): India has found a new source of a strategic metal, vanadium, in the ocean sediments off the west coast. The sediments contained 0.5 per cent vanadium and it would be profitable to mine it, a spokesman of the regional research laboratory (RRL) in Bhubaneswar said. He said the RRL had analysed the sediment samples provided by the National Institute of Oceanography in Goa. Vanadium is presently imported. It is used in steel and non-ferrous alloys and also as a catalyst. It is also required by India's nuclear and space projects besides the aviation industry. The spokesman said that vanadium was present along with titanium in the ocean sediment. Titanium ores found elsewhere in India do not contain vanadium. [Text] [Bombay THE TIMES OF INDIA in English 16 Mar 81 p 5]

CSO: 5100

BRIEFS

NUCLEAR CAPABILITY STUDY DENIED--Tokyo, 30 Mar (KYODO)--A Socialist Dietman charged Monday that a government project team conducted a study on Japan's ability to arm itself with nuclear weapons. The dietman, Tesu Noda of the Japan Socialist Party, told at a House of Councillors Budget Committee meeting that he had obtained a 230-page report on such a study, titled "Japan's Self-Defense and Its Potential Ability." Noda said the study was made on Japan's ability to arm with nuclear weapons from various angles, including technology, fiscal policy, manpower availability and laws. The report was quoted as saying that "Japan can produce only 1,000 or less than 1,000 atom bombs even if it utilizes all the uranium that can be found in its territories." According to Noda, the report further said that Japan has sufficiently trained technicians to produce nuclear weapons and that the production cost of an atomic bomb is about yen 100 million. Besides production ability, the report also touched on related matters such as means of delivery (of nuclear warheads), constitutional restrictions on nuclear arms, and the development of nuclear weapons in other countries, Noda said. In view of the materials and terminologies used in the report, Noda charged that the study must have been conducted by a project team formed by government officials or scientists at the request of the government. Responding to Noda's charge, Defense Agency Director General Joji Omura said his agency has never conducted researches aimed at development of nuclear arms. [Text] [OW301303 Tokyo KYODO in English 1236 GMT 30 Mar 81]

PLANT OPERATION SUSPENDED--Tokyo, 2 Apr (KYODO)--The Natural Resources and Energy Agency has ordered the suspension of operation of the nuclear power plant in Tsuruga, Fukui Prefecture, of Japan Atomic Power Co [JAPC], as the company failed to report a trouble which occurred in the reactor at the plant. Agency officials said the suspension order was issued since JAPC did not report the trouble to the agency or the Fukui prefectural government and continued to operate the reactor after repairs were made. They said an inspector of the agency dispatched to the power plant Wednesday found that radioactive water leaked out from a cooling system between the reactor and the turbine. The time when the accident occurred and the volume of radioactive water leaked out were not disclosed. The agency ordered the company to stop the operation of the plant Wednesday night and started a probe into the matter. The agency officials expressed regret over the matter, saying that failure of JAPC to report the accident betrayed the trust held by the people toward atomic power generation. The reactor at the Tsuruga plant of JAPC is of the boiling water type and has an output capacity of 357,000 kilowatts. [Text] [OW020103 Tokyo KYODO in English 0006 GMT 2 Apr 81]

NUCLEAR AID FROM U.S. URGED

Karachi MORNING NEWS in English 30 Mar 81 p 4

[Editorial: "Need To Go Nuclear"]

[Text] Pakistan's energy needs are rising with each passing day, and the costs of meeting them are going up correspondingly. Last year the country spent Rs1,200 crore on the import of oil, that is 50 per cent of its total foreign exchange earnings. This year it is expected the figure would go up to Rs.1,500 crore and by 1985 it is estimated that Pakistan will have to spend all its foreign exchange earnings on the import of oil. This is a grim picture and pinpoints the fact that switch over to nuclear energy is the only answer to Pakistan's crucial requirements in this sector. There is no alternative to it. Representing the case of Pakistan and other countries in a similar situation at a committee of the International Atomic Energy Agency at Vienna recently, the chairman of the Pakistan Atomic Energy Commission, Mr. Munir Ahmad Khan said: "The single most important issue in the world today was energy supply as it touched on the security, economic development and the survival of many nations." Speaking on the topic, President Zia-ul-Haq said in January that Pakistan was determined to acquire nuclear technology for peaceful purposes. "This entire programme," he said, "was to fulfill Pakistan's energy needs, and there was no reason to deprive Pakistan of the nuclear technology for being a Muslim, a developing and a non-aligned country."

The deal for a nuclear reprocessing plant was made by this country with France some years ago but U.S. intervention torpedoed the whole thing. Just how crying is Pakistan's need to switch over to the nuclear energy is testified by figures. In the United States, the per capita annual consumption of electricity is about 10,000 units, in Europe between 6,000 and 9,000 units while the world average is about 1,600 units. In Asia, even some poorer nations consume more than 300 units per capita annually. But in Pakistan the consumption is barely 160 units per capita annually and it cannot meet even this demand without going nuclear. Figures speak for themselves.

Under these circumstances the U.S. objection to Pakistan's switch over to nuclear technology can only be interpreted as unfriendly because it cannot pretend ignorance of the fact that the rising cost of oil is making serious inroads on the country's economic resources. If Pakistan does not find quickly an alternative, the economic effects would be too serious, and this would reflect on other fronts also.

The U.S. attempts to frustrate Pakistan's acquisition of a nuclear reprocessing plant is incomprehensible, when seen in the context of its professions of goodwill towards this country. There has been too much hue and cry in the Western Press about the Islamic bomb which Pakistan is supposed to make if supplied with a nuclear reprocessing plant. And that in spite of Pakistan's categorical assurances that its nuclear installations will always remain open to international inspection. But they have all fallen on deaf ears, not because they are not convincing but on account of the Western desire to keep the Muslim world specifically and the Third World generally in a state of backwardness and dependence.

In a letter addressed to the UN Secretary General in February, the acting permanent representative of Pakistan to the UN said: "The nomenclature of an Islamic bomb makes it quite evident that the Zionist circles have planted such stories in the information media in an effort to malign Islamic, non-aligned and Third World countries. The bogey of an Islamic bomb is a part of Israel's overall strategy of hiding its own real intentions of acquiring nuclear weapons." Commenting on the propaganda about the "Islamic bomb," the bi-weekly CRESCENT INTERNATIONAL of Toronto said: "Meanwhile no one need worry about the Hindu, Jewish or Christian bombs which are all for peaceful purposes." The disappointing behaviour of the United States and some Western powers with the countries in Asia, Africa and the Muslim world has softened some of them towards the Soviet Union which has been quick to take advantage of the situation. It would be wiser for the United States to strike a proper balance between its desire to please the Jewish lobby and its need to retain the confidence and friendship of these regions.

The former head of the Pakistan Atomic Energy Commission, Dr. I. H. Usmani, presently an atomic energy expert with the UN, has made the strange suggestion that instead of trying to acquire nuclear technology, Pakistan should develop solar energy. He argued during a speech at Islamabad recently that states trying to acquire nuclear technology may invite trouble. Dr. Henry Kissinger used the same logic in an effort to discourage Pakistan. One expected that being a former head of the Pakistan Atomic Energy Commission, Dr. I. H. Usmani would himself be the most ardent advocate of Pakistan in this matter. We are sure nobody wishing to see Pakistan strong and prosperous would pay any heed to his suggestions. There is no harm in harnessing solar energy but why should not Pakistan tap a better source? In some Western countries nuclear energy is being used on a limited scale in factories, farms, power houses, hospitals and residential houses. Why cannot Pakistan do the same?

The United States has been mainly instrumental in preventing Pakistan's nuclear deal with France and it would be pertinent to remind her that this, combined with some of the past experiences, has left bitter memories in Pakistan. Under the changed global conditions the United States is trying to reestablish the old ties with this country. Speaking the other day at Washington, a spokesman of the U.S. Administration said: "Right now we are trying to get into a position of trust and credibility with Pakistanis." Surely, for the United States, the best way to regain the lost confidence would be to help this country acquire the nuclear reprocessing plant. That would be the most convincing proof of American goodwill towards Pakistan.

CSO: 5100

COLUMNIST ARGUES AGAINST NUCLEAR POWER; CITES THREE MILE ISLAND

Bangkok BAN MUANG in Thai 16 Feb 81 p 5

[Hokria Siarat column by Wichitphan: "Nuclear Power Plants -- Waves Without a Shore"]

[Text] Concerning the case of Bask terrorists in Spain kidnapping the chief engineer in charge of overseeing the construction of the nuclear power plant with the intention of forcing the Spanish government to blow up this plant, the end result was that Spain had to find a new chief engineer to take the place of the former engineer who was killed in the line of duty by these ignorant terrorists who cannot tell the difference between the engineers who are carrying out their duties and the politicians who make the policies calling for construction [of such plants].

I would like to write a few lines in memory of this engineer and I hope that they provide a lesson for Thais on both sides. Using new technology in a country where almost 80 percent of the people are ill informed and do not even know their own rights is the same as [using] a two-edged sword -- [we] do not know what it will pierce or when.

Things that are not good may be said to be good while good things may be criticized as being bad.

Those who are thinking about building nuclear power plants in Thailand should give careful thought to this beforehand.

Since I am an engineer, I would certainly like to see our country bring in modern technology and use it in place of the old techniques. But as a Thai who is aware of the innate character of the Thai people, I do not think that it is at all necessary to rush into building nuclear power plants.

Increasing the efficiency of those in charge of caring for the various machines now in use will help satisfy the country's increasing energy needs, which have been calculated, for many more years.

Another thing is that, even though nuclear energy has been used peacefully for decades now, there have been occurrances in which the "poison" in this great source of energy has not been controlled carefully and it has become like a cobra that bites the person who feeds it whenever the person becomes careless.

And do the Thai people lack these two characteristics?

Even countries that now have the highest technology, such as the United States, cannot guarantee that the nuclear reactors, greater numbers of which are going into operation every day in these countries, are 100 percent safe. Many people have heard of the Three Mile Island incident in which hundreds of thousands of Americans nearly perished just like the Japanese at Hiroshima and Nagasaki at the end of the Second World War even though no world war had broken out.

In March 1979, the nuclear reactor located on this small island (probably 3 miles long like the name) sprang a leak while in operation without anyone becoming aware of this for several days. And to date, there are no signs that this nuclear power plant will be put into operation again.

Certainly, it will be claimed that this was an accident that could occur no matter how carefully things were looked after. But from what I have read in the October 1980 issue of the journal **NATIONAL** DEVELOPMENT, I learned the truth based on the investigation conducted by government and private scientists. The truth is that what has been called an "accident" was in fact not something that could have happened naturally by itself.

The only thing that can be considered natural concerns the stupidity concealed behind the cleverness,but carelessness,of those concerned.

For example, concerning the water pipe that must be used to reduce the temperature of the reactor, in this emergency it should have been open all the time but instead, for some unknown reason, it was closed.

And the terrible thing that cannot be excused is that the warning system for use in such cases was of very poor quality. Instead of using a red light as a warning signal, the Babcox and Wilcox Company, the company that built the plant, used a green light instead.

And it appears that a small piece of paper had been placed in front of this strange light.

Yes, the Americans are very lucky that they did not die because of their own handiwork.

But I would like to ask whether we can really risk this fate? Because even though Thailand has been a Buddhist country for a long time, this does not mean that we can place ourselves above nature, just as some people foolishly think that there will be moral MPs to govern the country without them having to vote on election day.

Concerning what actually happened, if we summarize things to get at the main meaning to use as a lesson for the people of the world, the only lesson is that an accident happened because of the cleverness but lack of foresight of the Americans.

And so what hope is there with stupidity and not even any common sense?

11943
CSO: 5100

HUNGARIAN NUCLEAR POWER PLANT EQUIPMENT

Budapest MAGYAR NEMZET in Hungarian 28 Mar 81 p 4

[Excerpts] The installations of the Paks nuclear power plant represent a qualitative step forward in production of this type of equipment. The Soviet Union made 90 percent of the equipment for the nuclear power projects previously begun in other socialist countries. In the case of Paks, only 60 percent originated in the USSR; the remainder was manufactured in other socialist countries.

In the work distribution agreed upon between the socialist countries, Hungary undertook production and development of the type of nuclear power plant equipment best suited to its capabilities. It falls into two categories: high-technology vessels--based on Hungarian experience in production of sophisticated chemical industry as well as special purpose machinery--for the reactor area and remote-controlled automated equipment for assembly and repairs.

Production of the units of the assembly and repair equipment posed a great challenge. This type of equipment is lowered into the reactor area by crane when repairs due to some malfunction become necessary. Performance of the remote-controlled devices can be followed on a monitoring screen. After completion of repairs, the special-purpose equipment is removed and decontaminated. The first pieces of the three types of specialized equipment have been completed. The screw drivers serve to fasten and unfasten the cover of the reactor block. The Czech-made reactor block of the Paks plant will be assembled with Hungarian automatic screw-driving equipment.

The purpose of the second Hungarian robot is to repair defects in the system of pipes of the primary circuit. Using an industrial camera, the device will locate the defect, make repairs, and review its own performance. The third device is a so-called cassette remover. It weighs more than 100 tons and is equipped with manipulators used for removing bundles (cassettes) of spent fissionable material and replacing them with new ones. Hungarians are already working on an updated version of the device. I will replace cassettes as needed on the basis of a special computer program. Its performance can also be monitored from the outside.

The CEMA specialization agreement for production of nuclear power plant equipment is valid until 1990. The schedule specifies when and what type of equipment each of the participants is to deliver. Like other signatories, Hungary hopes to offset the cost of equipment for its nuclear power plants through shipment of specialized equipment to other participants in the agreement.

CSO: 5100

UDC 553.485.042:622.349.5(497.1)=861

PROSPECTING FOR, PRODUCTION OF URANIUM IN YUGOSLAVIA

Belgrade TEHNIKA in Serbo-Croatian No 1, 1981 pp 67-68

[Article by Milan Petrovic, engineer and independent adviser in the Federal Committee for Energy and Industry, Belgrade; submitted 8 Aug 80]

[Text] Introduction

Exploration for uranium in Yugoslavia began in 1948 with modest technical capabilities and personnel and also with inadequate familiarity with the geology of this mineral which is a source of energy. Explorations were conducted with more or less uniform intensity up until 1971, and during them the existing methods were refined and new and more up-to-date ones were introduced, and personnel were developed through education in Yugoslavia and abroad.

The crisis on the world uranium market in the sixties had some bearing on the volume and even occasional interruptions in uranium explorations in Yugoslavia, as it did in a number of other countries, but the principal influence was the absence of a program for development of nuclear power, that is, the failure to examine its true place in the long-range development of the country's entire fuel and power industry.

Beginning in 1972 exploratory activity dropped off considerably and was reduced mainly to the immediate area of uranium deposits and the uranium mine under construction at Zirovski Vrh in Slovenia, and that situation has persisted until the present.

The agreement among the republics and provinces on the development of nuclear power up to the year 2000, which is now being drafted, calls for considerably more intensive prospecting of uranium deposits in Yugoslavia, whose potential for uranium is judged to be considerable, as well as for the taking of other steps to obtain uranium from domestic sources and to furnish the country a more secure supply of this mineral.

The Extent to Which the Country Has Been Explored for Uranium

On the whole the coverage of Yugoslavia by exploration for uranium is very low both in the regional sense, i.e., with respect to locating immediate areas of structures

that could contain ore reserves, and also with respect to the amount of prospecting and value assessment of mineralizations and deposits already known. The inadequate extent to which the country has been explored can best be seen from the fact that reserves in the higher categories (up through C_1) and about 22 percent (up through C_2) of total reserves of all categories, while feasible reserves have been established at only one deposit (Zirovski Vrh) and amount to about 4 percent of total uranium reserves in the country.

However, even though exploratory activity has been inadequate in the past, the results obtained both in the phase of prospecting and detailed mining-geological explorations, and also in metallogenetic study and regionalization of promising terrain indicate the need for further explorations and serve as a solid foundation and pointer for undertaking specific exploratory efforts using up-to-date knowledge, methods and techniques in order to discover commercial reserves of uranium.

Studies conducted so far have identified a number of spatially large geological formations in which the uranium potential has been evaluated and where uranium deposits might be discovered with appropriate exploratory procedures. In this sense and in accordance with new knowledge about uranium geology, there is good reason not only to study the potential of geological formations which have not so far been tested, but also to conduct a more detailed metallogenetic regionalization of certain geological units which have been studied on the regional basis in order to narrow down the space and guide explorations into the most promising areas.

A space of about 65,000 square kilometers has been covered over the last 20 years or so by various methods of geological, geophysical and geochemical prospecting, above all using aerial radiometry and hydrogeochemistry.

Use of these prospecting methods has revealed hundreds of anomalies of radioactivity and uranogeochemical anomalies, which include numerous mineralizations and some dozen uranium deposits, most of which have not so far been adequately explored and evaluated from the standpoint of economic geology.

Prospecting methods have not, however, so far covered all terrains in the country which are promising with respect to uranium. In addition to this we should emphasize that there is good reason to explore once again most of the terrain prospected previously in view of the capabilities of up-to-date methodology and techniques. It is therefore estimated that in the coming period prospecting activity should be undertaken on a number of terrains in the country with a total area of about 50,000 square kilometers.

More detailed mining-geological explorations at deposits and localities, where preliminary explorations established uranium reserves in the lower categories and where the results achieved indicated the possibility of discovering feasible reserves, have been conducted above all at the Zirovski Vrh deposit, and then on Stara Planina, Zletovska Reka, etc.

As the explorations for uranium ore were carried out, personnel were trained, equipment was purchased and research was done on relevant procedures for processing various types of uranium ores and for obtaining uranium concentrate (U_3O_8), often

called "yellow cake." The principal technological parameters for processing uranium ore at the Zirovski Vrh deposit and Stara Planina, which we arrived at through our own research, have been confirmed in practice on a semi-industrial scale in appropriate installations for these two localities.

Tests have been run on a laboratory scale and the principal process designs have been established for obtaining uranium from the ores of several of our deposits. Important results have also been achieved in obtaining uranium from phosphoric acid and the ash of certain types of coal.

Uranium Ore Regions

The possibility of discovering uranium ore deposits and of upgrading the present reserves which have not been adequately explored to reserves of higher category or feasible reserves are important in a number of regions in our country.

On the basis of the present extent of exploration in Yugoslavia, the greatest opportunities for finding new reserves of quality ore lie in the immediate and broader vicinity of the uranium deposit at Zirovski Vrh, and then in the vicinity of Skofja Loka and at other localities in Slovenia, which are built up of Permian terrigenous sediments in which numerous cases of uranium mineralization have already been discovered. That these sediments contain uranium is beyond doubt. However, it is difficult to explore them both because of the complicated geological-tectonic relations and also because they are covered by thick layers of younger sediments.

More detailed explorations around uranium deposits in Serbia, above all at Bukulja and Stara Planina, would probably augment reserves, and explorations in the immediate and broader vicinity of these and other deposits and uranium mineralizations would augment them considerably (Bukulja, Stara Planina, Iverak, Kukavica, Vranjski Basen, Golija, Kotlenik, etc.).

The situation is similar in Macedonia. There are sound possibilities of finding new uranium reserves associated with known deposits and in their immediate vicinity (Zletovska Reka, Podares, Selce, etc.), but there is also a well-known and sound uranium-bearing potential in the broader vicinity of those deposits and in other areas (Osogovske Planine, Plackovica, Belasica, Moriovo, Prilepsko-Bitoljsko Polje, etc.).

The extent of geological study and in general the extent of exploration for uranium of terrains in Croatia, Bosnia-Hercegovina and especially Montenegro is appreciably lower, and it is difficult to speak today of real possibilities of discovering commercial reserves of uranium. However, in view of the geological composition of the terrain and its similarity to the same terrain in other regions of the country where uranium mineralization has been discovered, there are prospects for discovering uranium deposits even at certain terrains in those republics (Gorski Kotar, Lika, central and eastern Bosnia, and other terrains).

Uranium Production

At present there exists the possibility of building in the country only one uranium mine and corresponding processing installation at Zirovski Vrh, with an annual capacity of 120 tons of U_3O_8, an amount sufficient to produce the fuel needed for 1-year operation of the Krsko Nuclear Power Plant.

Construction of the mining and processing installations is under way, and in spite of the problems that exist associated with construction of this type of facility, they are expected to be put into trial operation in late 1981, and planned production would take place in 1982.

The results of mining-geological explorations achieved in recent years indicate rather real possibilities for increasing uranium production at that mine, which could satisfy not only the Krsko Nuclear Power Plant, but also a portion of the needs of one more nuclear power plant.

Projection of Future Development

In accordance with the constitutional provisions, exploration for minerals and exploitation of mineral resources, including nuclear minerals, are in the competence of the republics and provinces. In the current 5-year planning period modest exploration programs are mainly being carried out in the various republics and Province of Vojvodina. Endeavors to reach an agreement covering the entire country on a unified effort to explore for uranium and exploit it, first of all within the country, but abroad as well, are aimed at greater and more effective activity in this field.

Various measures and actions have been undertaken in recent years, above all by the phosphoric acid industry (Prahovo, Kutina, Zorko of Sabac, etc.), to ensure application on an industrial scale of the technology for manufacturing uranium as a by-product in the production of that acid. Research done so far and other activities indicate that about 150 tons of U_3O_8 per year could be obtained by this process in 2 or 3 years only at Prahovo and Kutina, our two largest centers for production of phosphoric acid. This production, which, to be sure, is at present based on imported raw materials—phosphates, could soon cover the annual needs of a nuclear power plant with a capacity of about 1,000 megawatts.

Phosphoric acid is also being produced at several other smaller installations which according to development plans will be appreciably enlarging their capacities, so that possibilities for obtaining uranium from phosphoric acid are considerably greater, and by the end of this century we might obtain about 250 tons of U_3O_8 per year.

We should also mention that in spite of the fact that on a world scale raw phosphates contain large uranium reserves, larger even than the reserves known today in uranium deposits, actual mining and processing of phosphate aimed at obtaining uranium alone is several times more expensive and will not be relevant in the foreseeable future.

Aside from the uranium from phosphate, that is, phosphoric acid, great efforts are being made today in certain countries to extract uranium from the ash of coal, primarily lignite, and at one time we did quite a bit of work on this as well. The relevant research activity on extraction will probably be undertaken in our country as well in view of the fact that certain of our coals contain certain quantities of uranium.

According to our present knowledge of geological characteristics of uranium deposits in our country, most of them are relatively small and contain low-percentage ores which will be used sooner or later, so that we need to find appropriate solutions for their optimum exploitation, i.e., to obtain uranium concentrate at a price which the market can accept.

When a more significant program is adopted for use of nuclear power, it will probably become evident that we need to explore for uranium and exploit it abroad, above all in the developing countries, and possibly purchase and stockpile certain amounts of this valuable mineral fuel; this is today a frequent practice in the world, that is, in the countries which have such a program.

Preliminary examinations of the development of nuclear power up to the year 2000 in Yugoslavia, based on a projected volume of about 6,000 megawatts, would seem to support combined efforts to supply these installations with uranium, namely: both by exploring for uranium and exploiting it in Yugoslavia and abroad and also by obtaining uranium from phosphoric acid and from other sources, but by purchasing certain amounts outside as well.

Finally we should emphasize the fact that carrying out a nuclear power program presupposes a reliable supply of uranium, whose purchase on the world market is not always certain, and the discovery and exploitation of our own deposits presupposes prior exploration over a long period of time (10-15 years or even longer in some cases).

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COBOEN SEEKS NEW POLICY OUTLINING MEDIUM, LONG-RANGE PLANS

La Paz PRESENCIA in Spanish 20 Feb 81 p 8

[Text] The Bolivian Nuclear Energy Commission (COBOEN) has asked the government for urgent approval of a new policy covering that sector's medium and long-range objectives.

COBOEN advised that it has presented the Council of Ministers with a series of proposals on new legal provisions pertaining to the exploitation and utilization of domestic nuclear energy resources.

The new provisions were based on analysis of everything done up to now in the nuclear energy field. "We are seeking," an official communique says, "to come up with measures which will eliminate factors contributing to the delay in our country's nuclear energy program and speed up the development of that program."

The new guidelines of the Bolivian nuclear policy proposed by COBOEM are aimed at establishing adequate mechanisms for the centralization, coordination and supervision of the development of that type of energy in Bolivia, "so that this science will be an additional factor in our national development."

According to an official bulletin from COBOEN, the new plans are to be "harmonized" with development plans being promoted by other sectors of the national economy and will be designed principally to contribute to the nation's security.

"The guidlines establish the goals and mechanisms to be used in such activities as exploration, mining and metallurgy (relative to radioactive deposits), the investigation and arranging of services, international relations, human resources and other areas," the communique adds.

Among the measures proposed by COBOEN is a change in its legal status, currently not compatible with its plans and projects, according to the communique.

COBOEN is a decentralized organization subordinate to the Ministry of Mining and Metallurgy. According to the latest official classification, COBOEN is listed as a "service" organization in the mining and metallurgical sector.

COBOEN also offered the government plans for a new statute and a "more rational, dynamic and effective organizational structure compatible with the principles of institutional policy and its legal status and backed by the necessary domestic labor regulations."

COBOEN also suggested the passage of a law on future control mechanisms to be applied to the import, inspection and utilization of radioactive equipment and materiel. This bill would include regulations on the protection of both people and environment.

COBOEN will be the organization charged with supervising the implementation of the new norms on the use of radioactive materiel and energy, according to the plan.

In announcing the presentation of these projects, the COBOEN directorate expressed optimism on the possibility that the government will respond promptly and favorably to the proposals submitted.

They stressed the point that lack of a nuclear policy has impeded the development of activity in this sector.

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EXPERT DEEMS LIGHT WATER REACTOR TO BE ENERGY OPTION

Santiago EL MECURIO in Spanish 9 Mar 81 p C-4

[Text] "It is perfectly feasible to build light water reactors to generate electricity in this country," Engineer Marcelo Gruenberg Stern told EL MECURIO during his visit to Chile. He is a 34-year-old Chilean working as coordinator for construction of an electrical generating plant for Kraftwerk Union AG in Offenbach, Federal Republic of Germany. That company was created 10 years ago through the merger of the energy departments of AEG-Telefunken and Siemens.

The Chilean professional, who left Chile to gain professional experience abroad, explained that the nuclear industry is developing new ideas about a 200-400 megavolt light water reactor which could be built in this country.

"The basic problem until now was that the nuclear plants on the market were economically interesting from 900 megavolts of installed power on up. The cost per kilowatt installed of smaller plants was very high because of the many systems and amount of equipment that must be installed regardless of the size of the plant."

Kraftwerk set out to find a way of optimizing a nuclear installation by saving on equipment and systems without impairing the safety of the plant, according to Gruenberg. He explained that, by using and selecting mass-produced components for nuclear plants now under construction and also employing such thermodynamic tactics as applying natural circulation in the primary circuit, reducing the power density of the core by half, and as a result increasing the useful life of the fuel element (replacing the fuel every 2 years, for instance), they arrived at a design that means a great reduction in costs and which, in Gruenberg's opinion, could be an alternative to the conventional coal or oil-fired power plants now in existence.

"This reactor," he added, "presents another interesting advantage, which is that the waste heat can be used to desalinate sea water, a very valuable application in the north.

"The nuclear energy exploited in a light water nuclear reactor is in the form of heat," Gruenberg explained, "heat which is generated when neutrons split the nucleus of uranium 235.

"The neutrons needed for this are the so-called thermic neutrons. Their energy has been reduced by the atoms of water which act as a moderator. The number of neutrons needed for the nuclear reaction is controlled by the bars which are intended to absorb possible excess neutron production."

Cruenberg said that there are two types of light water reactors being built. One is the boiling water reactor, which operates on a direct circuit with the turbine. In this case, the same medium--demineralized water--serves as a moderator, a coolant, and as steam operating the turbine. The other is the water pressure reactor, which operates on an indirect circuit to the turbine. Borized water circulates in the primary circuit, delivering its heat to the steam generators.

The power source is the so-called core of the reactor, which is the space occupied by the fuel--uranium. The reactor is a high-pressure steel vessel connected to various tubes which are mainly for transporting the coolant (water) and the heat. The water, transformed into steam, operates the turbine. The generator connected to the axis of the turbine uses its rotation--caused by the passage of steam--to produce electric current. After passing through the turbine, the steam is condensed and, closing the thermodynamic cycle, the water returns to cool the core.

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BRIEFS

HEAVY WATER AGREEMENT SIGNED--Mexico City, 24 Mar (EFE)--Two Mexican state agencies announced here today the signing of an agreement aimed at giving this country technology for the production, use and recovery of heavy water. The Mexican Petroleum Institute and the National Nuclear Research Institute noted that the agreement will permit the ...ification of the scientific potential of the two agencies and will obtain the support of the petroleum sector in matters pertaining to nuclear energy. According to the sources, the processing of heavy water will permit its use in the Mexican program of nuclear plants thus resulting in a decrease in investments and risks. They also reported that it results in an almost elimination of the transfer of foreign technology. Pemex Director Jorge Diaz Serrano affirmed that this country's oil and nuclear sectors may establish close ties of cooperation to prepare the nation for a transfer from hydrocarbons to other energy sources. The specific plans for Mexico to produce, use and recover heavy water were not immediately disclosed. [Text] [PA281725 Madrid EFE in Spanish 1644 GMT 24 Mar 81]

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SACLAY RESEARCH REACTOR, PARTICLE ACCELERATOR OPERATIONAL

Paris LE MONDE in French 5 Mar 81 p 16

[Article by J.F.A.: "Two New Fundamental Research Facilities Open at Saclay"]

[Text] Minister of Universities Alice Saunier-Seite, Minister of Industry Andre Giraud, and State Secretary for Research Pierre Aigrain recently inaugurated two major facilities for fundamental research at the Saclay (Essone) Nuclear Studies Center: the Saturne-2 particle accelerator, and the Orphee research reactor. These two facilities, one designed for the study of nuclear physics and the other for the physics of condensed matter, are the result of close collaboration between the AEC and CNRS.

The two organisms shared financing of these two projects -- 49 million francs for Saturne-2 and 172 million for Orphee -- and they entrusted the management of them both to joint agencies. Thus Saturne-2, in service for a little over two years for part of its experiments, is the responsibility of the AEC's Fundamental Research Institute and the CNRS Institute for Nuclear and Particle Physics, while Orphee, which started up last December, is part of the Leon Brillouin Laboratory which the two organizations operate jointly.

Orphee: Exploring Condensed Matter

Essentially designed to furnish neutron beams for fundamental research, the Orphee reactor was built with the AEC Fundamental Research Institute as general contractor, and replaces the EL-3 reactor which was shut down in March 1979. Although less powerful (14 thermal megawatts instead of 18), this pool-type reactor delivers a flow of neutrons four to five times higher than that supplied by EL-3. Such resources are of interest to chemists, biologists, metallurgists, and of course physicists, since neutron beams are particularly fine tools for probing condensed matter -- that is, solid-state, liquid-state, and sometimes gaseous-state matter -- by neutron diffraction and spectometry.

Research seeks to understand the origins of the physical properties of matter -- mechanical, thermal, electrical, and magnetic properties -- and this implies prior study of its structure (organization of the atoms of its molecules, of the forces which bind these atoms, and so on). These are all studies which the new Saclay reactor should help carry out, or initiate in some cases, before they are turned over to the Grenoble high flux reactor.

The experimental devices surrounding Orphee's highly enriched uranium core (*) make it possible to obtain 20 neutron beams which can be used in various ways. However, sources of neutron radiation being rare and of low intensity compared to other radiation sources (such as X-rays), the Orphee neutrons will be reserved for studies on the structure of magnetic or biological materials, the configuration of polymer chains, and the nondestructive inspection by transparency of pyrotechnical materials (explosive filaments), used notably in the European rocket Ariane. The first measurements on these topics should begin next month. But this area of study remains a secondary part of the reactor's research program, which is a very full one according to the Leon Brillouin Laboratory director. In addition to the French, only Belgians, Germans, and Austrians will be able to work with the reactor for the time being.

Saturne-2: Studying Nuclear Mechanisms

The Saturne-2 particle accelerator, installed at Saclay, is not strictly speaking an entirely new facility, but rather a radical transformation of the former proton synchroton which elementary particle physicists used from 1958 to 1977. During the intervening 20 years, this field of physics has evolved a great deal and Saturne very quickly found itself outclassed by new equipment as elementary particle physicists demanded accelerators with higher energy. Such instruments are making the heyday of the European Center for Nuclear Research (CERN), for example.

For this reason Saturne was reoriented toward the study of atomic nuclei, for which it was not especially suited. This is why it was decided as early as 1973 to completely redesign it and build a competitive device producing particle beams with better definition and more refined geometry, in an energy range of 250 to 3000 MV. Such performances meet the requirements of nuclear physicists in the study of atomic nuclear structure and nuclear reactions.

To this end Saturne-2 can accelerate protons, but also light nuclei (deuterons, alpha particles), polarized particles, and heavy ions. Thus French and foreign physicists should be able to work in four basic research areas: the study of forces between protons and neutrons which are the components of the atomic nucleus; the study of certain ephemeral particles and of excited states of nucleus components; and the study of heavy ions of nuclear matter placed under extreme physical conditions such as no doubt exist in certain stars. In addition, dosimetry, radiology, and three-dimensional radiography experiments will also be conducted.

(*) It contains 6 kilograms of highly enriched uranium supplied by the United States. The core is changed every 120 days.

With Saturne-2, French researchers have a relatively competitive instrument for years to come. For two years already, the first beams of particles and light nuclei have been produced by the device. Polarized particle beams should become available next April, and heavy ion beams in early 1982. However, in order to continue staying ahead, the scientific community is asking for the installation of a small accelerator, called MIMAS, which for a cost of 28 million francs would improve the performance of Saturne-2.

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CERN ACCELERATOR CONSTRUCTION PROBLEMS, OPPOSITION

Paris LE MONDE in French 5 Mar 81 p 30

[Article by Marc Ambroise-Rendu: "The World's Largest Accelerator is Off to a Bad Start"]

[Text] Geneva--The LEP project, which is an enormous track on which CERN [European Organization for Nuclear Research] physicists intend to launch electrons to discover new particles, is off to a difficult start. Out of the 40,000 meters of underground galleries which are due to house scientific equipment for the world's largest accelerator, workers who have been blasting underground at Gex have only opened 30 meters of well in four months.

But opponents are already doing battle. The Gex association for protection of the environment, the local CFDT union, and four individuals -- including the mayor of Echevenex and the president of the agricultural union of Crozet, both of these districts being among those involved -- announced at a press conference on Monday 2 March that they had just appealed to the courts to halt construction.

CERN, which had been polishing its project for the last five years, thought it had foreseen everything. This enormous research complex located in the Geneva suburbs, straddling the French-Swiss border, is by far the largest employer on the shores of Lake Leman. 7200 scientists, technicians, workers, and employees depend on it. For a quarter of a century it has progressively extended its laboratories and is digging its underground accelerators in the narrow valley lying between the lake and the first ranges of the Jura mountains. It already covers 400 hectares, leased to it by France for 99 years.

This has not been enough. In order to overtake their Soviet and American colleagues, European physicists needed a superpowerful machine where positrons and electrons will collide (see LE MONDE of 27 June 1979). By provoking these collisions, scientists hope to bring to light mysterious and new particles christened W and Z, whose existence is inferred from theoretical calculations. The LEP (large electron positron storage ring) machine must be enclosed in a circular gallery, 30 km in circumference and 4.40 m in diameter. It's one of the world's longest tunnels. Positioned around it will be eight giant halls serving as intersection points for collisions and observations. Access will require the digging of three more galleries over 10 km. This vast underground network can only extend in the direction of France, that is, below Gex and the Jura. Drilling equipment

will have to chip away at the rock underlying seven districts for about 10 years, sometimes 1000 m below the surface.

Nearly everyone accepts the justification, or at least the interest, of the project. CERN has three assets: economic power, scientific glory, and European prestige. Local PC (Communist Party) and PS (Socialist Party) sections, with many physicists among their members, agreed immediately. After 48 hours of resistance, six mayors out of seven also gave their assent. The final decision should be reached by the various governments during the course of this year.

A 4125-Meter Tunnel

Meanwhile, CERN is digging a well 86 m deep, from whose bottom a horizontal gallery will extend for 4125 meters. Work is scheduled to take at least one year. Arguing that this is an exploratory tunnel designed to assess the nature of the substrata, the performance of equipment, and therefore the estimated cost of the final project, CERN received authorization from the Ain prefect to temporarily occupy lands being drilled. This procedure, which avoids all expropriation and therefore all public inquiry, has been found shocking. Ecologists, plain landowners, agriculturalists, and unionists have deemed that their questions went unanswered, that consultation was inadequate, and that the cart was being put before the horse in this case. On 18 December 1980 they appealed to the Lyon administrative court, requesting cancellation of the prefectoral permit which they claim is illegal. Naturally, they are also asking the suspension of work pending the decision of the courts.

There was general amazement in the Gex region where prefectoral authority is respected and CERN power is feared. One of the petitioners, Jean-Roger Honorat, mayor of Echevenex, said: "Listening to my colleagues, I have the impression that I committed lese-majeste. And yet I am not at all opposed to the LEP project, but I would like to see things done properly and legally."

Protesters -- who for the most part do not want to be cast as opponents -- base their action on three causes for concern. They fear that the test gallery will become a permanent access tunnel, and that therefore the overall project is already a foregone conclusion. The districts would then be faced with a fait accompli. They would no longer have any way of negotiating any given modification.

The second worry is that drilling the tunnels will seriously disturb the underground water system. It is feared that the water catchments and springs which already often go dry in summer may dry up permanently. The mayors have asked CERN to sink probes in order to better examine the underground conditions. The physicists replied that this was too costly. "Well then, give us a written commitment to guarantee our water supply." There was no reply.

Results of initial work are deepening this concern. Some drillings have perforated petroleum deposits and the water table is becoming polluted by hydrocarbon leaks. CERN is accused of having kept this fact to itself. Who will pay for damage which may be caused by construction? "The state", according to the prefect. "CERN", replies the ministry of foreign affairs. No one knows whom to believe anymore.

The protesters have a third worry: employment. CERN asserts that if it is not allowed to build LEP, its future is compromised. CFDT unionists fear that the situation may be reversed. These huge operations, whose cost is estimated at 2.2 billion francs -- probably a low estimate -- will tie up one quarter of CERN's normal budget. The unionists explain that "in order to save, the European laboratory will have to slow down older installations. We estimate that at least 400 people will be dismissed."

In the final analysis, the protesters are wondering if the LEP project might not be both a disproportionate and a hasty one. They do not believe that international competition calls for its construction "at whatever cost." In any case, they want the physicists to tell "the whole truth", the total estimated cost to be clearly stated, and a serious impact study to be presented. In conclusion, they want the pros and cons carefully evaluated before undertaking a risky project which they fell can seriously perturb the environment and the people of the Gex region.

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BRIEFS

ANTINUCLEAR ANARCHISTS--Fearing a resurgence of attacks against nuclear power plants, the police services are disturbed by the presence on numerous antinuclear committees of militant anarchists belonging to the OCL (Libertarian Communist Organization) which has a total membership of some 1,000. [Text] [Paris LE POINT in French 30 Mar 81 p 47]

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